GLINKOV, M.A., doktor tekhnicheskikh nauk, professor.

Principles of fluid mechanics in baths and the heat-working of open-hearth furnaces. Stal' 16 no.4:356-358 Ap '56. (MLRA 9:7)
(Open-hearth furnaces)

GLINKOV, M.A., professor, doktor tekhnicheskikh nauk; MEN'SHIKOV, R.I., kandidat tekhnicheskikh nauk.

Investigating heat exchanges in open-hearth furnace combustion chambers. Sbor. Inst. stali no.35:146-157 '56. (MIRA 10:8)

1. Kafedra metallurgicheskikh pechey.
(Open-hearth furnaces) (Heat--Transmission)

Translation from: Referativnyy zhurnal Metallurgiya [illegible] (USSR)

AUTHORS: Glinkov, M. A., Krivandin, V. A.

TITLE: The Pressure Distribution in High-temperature Ceramic Recuperators (Raspredeleniye davleniy v vysokotemperaturnykh keramicheskikh rekuperatorakh)

PERIODICAL: V sb.: Prom. pechi. Moscow, Metallurgizdat, 1956, pp 158-165

ABSTRACT: A report on experiments on the determination of the pressure drops of the air and of the flames in ceramic recuperators (R) in which the flue gases proceed downward through vertical pipes and the air moves in a loop-shaped path from the bottom toward the top passing horizontally between the staggered flue-gas pipes. In order to determine the pressure drops of the air and the flue gases at any point in the R, it is necessary to know their entrance pressures and the pressure at the given point of the R. The pressure change of the flue gases is readily computed since the frictional resistance and the geometric head are known. The computation of the resistance to the movement of air is more complicated. It is composed of the resistance of a group of flue-gas pipes and of the [illegible] turn at

Card 1/2

The Pressure Distribution in High-temperature Ceramic (Cont.)

the end of each group. The resistance of such turns, which depends on the velocity of air and on the number of the rows of open orifices, was determined by means of an aerodynamic model of the R. At $R_e > 4700$, the resistance of the turns remains constant. When the number of rows of open orifices is increased from 1 to 4, the resistance is considerably reduced; however, any further increase in the number of rows of open orifices has almost no effect and the resistance remains practically constant.

M. R.

1. Ceramic recuperators--Pressure distribution

Card 2/2

GLINKOV, M.A., professor, doktor tekhnicheskikh nauk; VAVILOV, N.S., kandidat tekhnicheskikh nauk.

Heat exchange in metallurgical furnace combustion chambers. Sbor. Inst. stali no.35:166-185 '56. (MIRA 10:8)

1. Kafedra metallurgicheskikh pechey.
(Metallurgical furnaces) (Heat--Transmission)

GLINKOV, M.A., professor, doktor tekhnicheskikh nauk; KRIVANDIN, V.A., kandidat tekhnicheskikh nauk.

Characteristics of heat exchange at the stack side of a tubular ceramic recuperator. Sbor. Inst. stali no.35:186-200 '56.

(MIRA 10:8)

1. Kafedra metallurgicheskikh pechey.

(Heat regenerators) (Heat--Transmission)

SOV/137-57-12-23158

Translation from: Referativnyy zhurnal Metallurgiya, 1957, Nr 12, p 40 (USSR)

AUTHORS: Glinkov, M. A., Markov, B. I.

TITLE: The Fusion of a Layer of a Metallic Charge Heated From Above (Plavleniye sloya metallicheskoy shikhty, nagrevayemogo sverkhu)

PERIODICAL: V sb.: Proiz-vo stali. Moscow, Metallurgizdat, 1956, pp 222-238

ABSTRACT: To conduct laboratory studies of the process of fusion (F) of a metallic charge (Ch), an experimental installation was designed which consisted of two adjoining chambers: an upper chamber containing the heating unit and a lower chamber containing the basin with the fusible charge. In order to reduce heat losses the internal surfaces of the chambers were coated with Ag and equipped with a system of evaporation cooling. Pb was selected as the charge material because it may be utilized in charges of all shapes and dimensions. The charge was placed into a steel shell fitting snugly into a steel cylinder equipped with a mesh cover intended to prevent the charge from rising above the top of the cylinder. The upward movement of the shell was accomplished by means of a special rod actuated through weight

Card 1/2

137-1957-12-23138

The Fusion of a Layer of a Metal Charge Heated From Above

The advance of the rod is a measure of the settling of the charge. To prevent the oxidation of the Pb the basin is filled with $N_2$. For all fusion processes readings are taken on the variation of the height of the charge layer with time, the amount of heat imparted to the charge, and the temperatures at various points of the layer. A series of fusions, identical in all respects, was performed with interruptions in order to observe the condition of the charge at various stages. A study of the charges cooled at different stages of the fusion process showed that the melt did not flow to the bottom but that it advanced downward along a single front, enveloping the solid lumps and giving up its heat to them. In rapid fusion the melt filled all spaces between the lumps, thereby preventing the liquid melt from transferring heat to the lower layers of the charge. From an analysis of the experimental melts the fusion process may be divided into three stages: the heating of the surface of the charge to the melting point, the fusion preceding the complete settling of the layer, and the fusion after the complete settling of the layer and after the formation of a free liquid surface.

Card 2/2

M. R.

1. [illegible] 2. Furnaces—Heating 3. [illegible]—Applications

137-58-6-11678

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 65 (USSR)

AUTHORS: Glinkov, M.A., Men'shikov, R.L., Morozov, V.A., Shorin, A.F.

TITLE: Thermal Operation of an Open-hearth Furnace When Oxygen is Used to Intensify the Combustion Process (Teplovaya rabota martenovskoy pechi pri primenenii kisloroda dlya intensifikatsii protsessa goreniya)

PERIODICAL: V sb. Primeneniye kisloroda v metallurgii. Moscow, Metallurgizdat, 1957, pp 95-114

ABSTRACT: Results are presented of an investigation on the introduction of O into the flame jet through a tuyere from the sides of the duct into a 200-t furnace at the "Zaporozhstal'" Works. When the oxygen enrichment of the air is 25% and the maximum heat input is 33.2 mill. kcal/hr, output rose by 32.2% and the nominal consumption of fuel dropped by 16.8%. With 30% enrichment and a maximum heat input of 33.4 mill. kcal/hr, the figures were, respectively, 61.0 and 35.0% of those of non-oxygen heats. Ratios for output and unit fuel consumption to average thermal stress and degree of enrichment of the air by $O_2$ are given. The following factors are examined: the conditions of

Card 1/2

137-58-6-11678

Thermal Operation of an (cont.)

temperature in the course of a heat, the distribution of heat flow across the area of the bath, and the change in the composition of combustion products in the working space. Heat balances are compiled as an average for a heat for various thermal and oxygen regimes.

G.G.

1. Open hearth furnaces--Performance [illegible] oxygen--Applications

Card 2/2

SOV-137-58-8-16508

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 8, p 39 (USSR)

AUTHORS: Glinkov, M.A., Demin, G.I.

TITLE: Recirculating-heat Steel Smelting Furnaces (Retsirkulyatsionnyye staleplavil'nyye pechi)

PERIODICAL: V sb. Primeneniye kisloroda v metallurgii. Moscow, Metallurgizdat, 1957, pp 186-216

ABSTRACT: Recirculating-heat furnaces (RF) are classified as a third type of steel smelting furnaces characterized by bilateral heating of the hearth (H); unlike open-hearth furnaces, the process of heating is continuous (the supply of heat to the H is uninterrupted) which makes it possible to utilize the principle of heat recovery (analogous to the method employed in direct-current furnaces) rather than regeneration, as is typical of open-hearth furnaces. The RF may operate with hot or cold blowing. They may operate on nonenriched air alone, provided the latter has been heated to a high temperature, because complete combustion of fuel in the H of an RF requires considerably smaller amounts of excess air than in the case of direct-current or open-hearth furnaces (1.1 instead of 1.3); consequently, the

Card 1/3

Recirculating-heat Steel Smelting Furnaces

temperature effect of air which had been preheated to a temperature of 800°C in an RF is equivalent to the effect of air preheated to 1100° in an open-hearth furnace. The authors present data of an investigation of a 10-ton fuel-oil operated RF which had been placed into operation in 1952 at the Novo-Tul'skiy metallurgical plant and which operated without heated-air blowing until 1955 at which point it was equipped with tubular (fireclay tubes) recuperators. Prior to 1955, the RF operated on air enriched with 70-80% of $O_2$ at a pressure of approximately 2 at. Hot air from the recuperators equipped with end-mounted tuyeres with nozzles, passes into the H through short uptakes which are inclined at a 16° angle. Since the volume of the checkered brick work of the recuperator constitutes 70% of the required volume, it was found possible to heat the air in amounts only up to 3000-3500 nm³/hr. Expressed in millions of kcal/hr, the thermal loading of the furnace constitutes 8.5-9.0 during the charging-fusion period, and 1.0-4.5 during the finishing stages. As a result of the investigation it was found that the RF's are capable of smelting soft iron (of the Armco type), steels Nrs 2 and 3, carbon steels Nrs 30, 40, 45, and with particular ease, low-carbon types of steel, because the mean rate of combustion of C amounts to 2-4%/hr. The smelting time varied between 1.98 and 2.82 hrs; the consumption of conventional fuel fluctuated from 965 during smelting on completely liquefied

Card 2/3

SOV/[illegible]-58-8-16/08

[illegible]

metal [illegible] to 1760 kg for all [illegible] ing on a [illegible] smelt Armco Fe [illegible] melting on ment of [illegible] The employ- consumption of [illegible] reduction in the [illegible] practi- [illegible] smelting performed [illegible] temperat[illegible]

N.L.

Card [illegible]

SOV/137-58-7-14369

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 7, p 60 (USSR)

AUTHORS: Glinkov, M.A., Ivanov, N.I.

TITLE: A Recirculation Method of Oxygen Use in Large Open Hearths (Retsirkulyatsionnyy metod primeneniya kisloroda v bol'shegruznykh martenovskikh pechakh)

PERIODICAL: V sb. Primeneniye kisloroda v metallurgii. Moscow, Metallurgizdat, 1957, pp 255-284

ABSTRACT: An investigation is made of the operation of a 185-t open-hearth furnace (OH) with $O_2$ employed by a recirculation method (RM) consisting of supplementary heating of the OH at various periods during the heat by fuel burnt in a blast highly enriched by $O_2$ (as much as 80-100%), the fuel and the blow being delivered to the melting chamber of the OH through both checker ports simultaneously. All other conditions being equal, heating from both sides makes it possible to increase the total heat intake of the bath by 19-20%, while a high level of enrichment of the blast by oxygen makes for a sharp reduction in thermal load on the outgoing side of the furnace. Thus, when the blow is enriched 40%, and the thermal load at the valve is

Card 1/3

SOV/137-58-7-14309

A Recirculation Method of Oxygen Use in Large Open Hearths

$35 \cdot 10^6$ kcal/hr. $15 \cdot 10^6$ kcal/hr are emitted from the melting chamber, but with 80% $O_2$ this figure is $9 \cdot 10^6$ kcal/hr, and with pure $O_2$ it is only $7 \cdot 10^6$ kcal/hr, i.e., almost as much as is rejected to the stack when the furnace is operated by standard open-hearth practice (SOP). The use of high-calorie fuel makes it possible in turn to reduce the quantity of combustion products per 1000 kcal of heat input to the furnace. Investigation has established that at identical thermal load on the valve, the use of RM only during the melting period provides an increase in OH output rate of 10-15 t/hr, i.e., 30-50% higher than the rate of output of this same furnace when worked by (SOP). The rate of melting of the charge in this case exceeds that by the SOP by 45-50%. When the RM is used during the charging, heating, and melting periods, the smelting rate may attain 96.2 t/hr, while the length of the heat is cut to 3.5 hours instead of 5 hours when the furnace is operated with the RM during the melting period only. The unit consumption of conventional fuel is reduced from 129 to 95.11 kg/t when the RM is used during the melting period only, and to 81.6 kg/t when the RM is used during the periods of charging, heating, and melting. The consumption of $O_2$ per ton of steel under these conditions rises from 50.0 to 66.81 and 129.1 $m^3$, respectively. When the furnace is operated by the RM, no need exists to change the charge in the direction of greater or smaller amounts of ore than is used in SOP.

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SOV/137-58-7-14369

A Recirculation Method of Oxygen Use in Large Open Hearths

The mean rates of carbon burn-off during the melting period were (in % per hour) 1.2-2.2, while the maximum was 3-3.4 and the rate during the working period was 0.83-1.04. An Fe balance compiled for all the experimental heats shows that operation of the furnace by the RM during the melting period only leads to a loss of 0.3-3% Fe by burning while use of the RM during the charging, heating, and melting periods increases this loss to 1,8-4,8%. An increase in the liquid-pig-iron contents of the charge from 65-70% to 90-100% does not affect the hourly output rate of the OH, the unit consumption of fuel and of $O_2$ as reported above, but makes it possible to attain an Fe pick-up of 3.7-6.1%. The temperature of the combustion products in the uptakes is no higher than with the SOP, the temperature of the uptake walls being 1680-1700°C. The temperature of the gas checkers dropped during the period of use of the RM (as combustion products were not passed through them), and the temperature of the air checkers fluctuated from 1200 to 1350°. The temperature of the roof and the air checkers is easily regulated by changing the fuel and $O_2$ flow.

1. Open hearth furnaces--Performance [illegible] N.I.

Card 3/3

GLINKOV, M.A.

DANIKHELKA, A., doktor, inzh.; MIKHAYLOV, O.A., kand. tekhn. nauk; GONCHARENKO, N.I.; KLIMASENKO, L.S.; OYKS, G.N., prof., doktor tekhn. nauk; SEMENENKO, P.P.; MOROZOV, A.N., prof., doktor tekhn. nauk; GLINKOV, M.A., prof., doktor tekhn. nauk; KAZANTSEV, I.G., prof., doktor tekhn. nauk; KOCHO, V.S., prof., doktor tekhn. nauk; ENEKESH, Sh., kand. tekhn. nauk; MOROZENSKIY, L.I., kand. tekhn. nauk; GURSKIY, G.V.; SPERANSKIY, V.G.; NOVIK, L.M., kand. tekhn. nauk, starshiy nauchnyy sotrudnik; SHNEYEROV, Ya.A., kand. tekhn. nauk; PAPUSH, A.G., kand. tekhn. nauk; MAZOV, V.F.; SAMARIN, A.M.

Discussions. Biul. TSNIICHM no.18/19:17-35 '57. (MIRA 11:4)

1. Glavnyy staleplavil'shchik Ministerstva metallurgicheskoy promyshlennosti i rudnikov Chekhoslovatskoy respubliki (for Danikhelka). 2. Direktor TSentral'nogo instituta informatsii chernoy metallurgii (for Mikhaylov). 3. Direktor Ukrainskogo instituta metallov (for Goncharenko). 4. Glavnyy staleplavil'shchik Kuznetskogo metallurgicheskogo kombinata (for Klimasenko). 5. Zaveduyushchiy kafedroy metallurgii stali Moskovskogo instituta stali (for Oyks). 6. Zamestitel' glavnogo inzhenera zavoda im. Serova (for Semenenko). 7. Zaveduyushchiy kafedroy metallurgii stali Chelyabinskogo politekhnicheskogo instituta (for Morozov). 8. Zaveduyushchiy kafedroy metallurgicheskikh pechey Moskovskogo instituta stali (for Glinkov). 9. Zaveduyushchiy kafedroy metallurgii stali Zhdanovskogo metallurgicheskogo instituta (for Kazantsev). 10. Zaveduyushchiy kafedroy metallurgii stali Kiyevskogo politekhnicheskogo instituta (for Kocho).

(Continued on next card)

DANIKHELKA, A.---(continued) Card 2.

11. Nachal'nik tekhnicheskogo otdela Ministerstva chernoy metallurgii Vengerskoy Narodnoy Respubliki (for Kookesh). 12. Zamestitel' direktora Novotul'skogo metallurgicheskogo zavoda (for Gurskiy). 13. Nachal'nik tekhnicheskogo otdela zavoda "Dneprospetsstal'" (for Speranskiy). 14. Institut metallurgii im. Baykova AN SSSR (for Novik). 15. Nachal'nik staleplavil'noy laboratorii Ukrainskogo instituta metallov (for Suneyev). 16. Nachal'nik laboratorii po nepreryvnoy razlivke stali Zhdanovskogo filiala TSentral'nogo nauchno-issledovatel'skogo instituta Ministerstva stroitel'noy promyshlennosti (for Papush). 17. Nachal'nik martenovskogo tsekha zavoda "Zaporozhstal'" (for Manov). 18, Zamestitel' direktora Instituta metallurgii im. Baykova AN SSSR, chlen-korrespondent AN SSSR (for Samarin).

(Steel--Metallurgy)

137-58-6-11703

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 70 (USSR)

AUTHORS: Glinkov, M.A., Mitkalinnyy, V.I.

TITLE: The Thermal Performance of an Open-hearth Furnace Operating by the Scrap Process (Teplovaya rabota martenovskoy pechi pri skrap-protsesse)

PERIODICAL: Sb. Mosk. in-t stali, 1957, Vol 37, pp 22-32

ABSTRACT: A description of the results of 300 experimental heats in a 70-t furnace at the "Hammer and Sickle" Works, with delivery of $O_2$ into the heavy-oil jet flame, are described. $O_2$ enrichment of the blow was 25-35%. Changes occurring in the temperature of the roof and flame in the course of a heat, at various rates of $O_2$ flow, are examined. The temperature of the roof during the charging period varied in accordance with the duration thereof from 1400 to 1650°C, attaining a minimum at the end of the charging period. During the melt-down and working period, the temperature of silica-brick roofs attained 1650°, while basic roofs reached 1780°. The temperature of the flame, measured by an optical pyrometer, was 1800° during the charging period and 1850° at the end of the melt-down in heats without

Card 1/2

137-58-6-11703

The Thermal Performance (cont.)

$O_2$, but with a 25% enrichment of the blow, the flame temperature rose to 1930° during charging, while 32% enrichment brought it to 1990°.

G.G.

1. Open hearth furnaces--Thermal properties 2. Open hearth furnaces--Test results

Card 2/2

137-58-6-11676

Translation from: Referativnyy Zhurnal, Metallurgiya, 1958, Nr 6, p 65 (USSR)

AUTHORS Glinkov, M.A., Vavilov, N.S.

TITLE Heat Exchange in the Space Above the Bath of a Recirculation-type Steel-foundry Furnace (Teploobmen v postranstve nad vannoy retsirkulyatsionnoy staleplavil'noy pechi)

PERIODICAL Sb. Mosk. in-t stali, 1957, Vol 37, pp 305-320

ABSTRACT A presentation of the results of an investigation of heat exchange in a 10-ton steel-foundry recirculation-type furnace (RF) having 9.6 $m^2$ hearth area and simultaneous two-sided heavy-oil feed at 2-3 atm excess pressure, sprayed by compressed air at 4-5 atm excess pressure. The heat flux, measured by a heat gage of special design rises gradually during the heat and then drops at the end of the working period. The heat flow over the bath, $Q_B$, varies across the width of the furnace from one melt to the next from between 800-1,100 thousand kcal/$m^2$hr at the front wall to 1200-1450 rearwards of the middle of the furnace, and drops to 1050-1150 thousand kcal/$m^2$hr at the rear wall. The take up of heat by the bath, $\Delta Q$, varies in similar fashion, attaining levels of ... 400 thousand kcal/$m^2$hr. $Q_B$ varies insignificantly along the length of the

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137-58-6-11676

Heat Exchange in the Space (cont.)

furnace, and $\Delta Q$ attains a maximum in the center of the furnace. The heat flux is distributed across the area of the furnace considerably more uniformly than in an open hearth, since the two-sided fuel feed makes it possible to maintain identical thermal conditions in either half of the working space. $Q_\Sigma$ varies during a melt as follows through the height of the working space: from 1100-1250 thousand kcal/m$^2$hr at a point 300 mm from the surface of the bath to 850-900 at a height of 1200-1300 mm. Curves are presented for the variation in calculated temperature and in black-body radiation of the gas at different [illegible] heat emissivity by radiation is 1500-2[illegible] kcal/m$^2$°C hr, while for an open-hearth furnace it does not exceed 1600. The bath surface is [illegible] 50% black and the temperature of the RF bath surface is 1700-1800°C. The temperature of the metal is the same as in an open-hearth furnace. In the RF the slag undergoes considerably greater overheating. In the RF there is virtually no [illegible] during the heat when the bath is not undergoing vigorous agitation. The directed heat exchange plays a significant role.

G.G.

[illegible]

Card 2/2

GLINKOV, M. A.

LEONIDOV, N K

25(5) PHASE I BOOK EXPLOITATION SOV/1497

Akademiya nauk SSSR. Institut nauchnoy i tekhnicheskoy informatsii

Metallurgiya SSSR, 1917-1957, t. 1 (Metallurgy of the USSR, 1917 - 1957, Vol. 1) Moscow, Metallurgizdat, 1958. 745 p. 3,000 copies printed.

Ed. (Title page): I. P. Bardin, Academician; Ed. (Inside book): G. V. Popova; Tech. Ed.: O. G. Bekker.

PURPOSE: The book is intended for scientific workers and engineers in metallurgical plants and in the machine-building industry It may also be used by students in advanced courses in metallurgical vuzes.

COVERAGE: This collection of articles covers extensively practical and theoretical developments in Soviet metallurgy during the last 40 years. The material deals with the discovery and development of the major ore deposits and the growth of the metal industry in various parts of European and Asiatic USSR Research institutes, laboratories, their location, and the names of the scientists and engineers involved are listed. Many papers contain so many references and names of various personalities that it was considered beyond the scope of the coverage of each article to list them. The authors claim that the processes, methods and theories described in this book reflect the most recent developments in Soviet metallurgy.

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Metallurgy of the USSR (Cont.) SOV/1497

Glinkov, M.A.. Development of Furnace Theory in the USSR 270
The author traces the development of scientific design of furnaces in the Soviet steel industry. The application of physical and chemical principles is presented in chronological order. The theoretical aspects of furnace operation and combustion processes are still under investigation. There are 52 references, 50 Soviet, 1 French, and 1 English.

Afanas'yev, S.G. Production of Converter Steel in the USSR 283
An outline is given of the development of converter steel production in the USSR. It is stated that present developments in the steel industry favor the converter process, especially the Thomas process, as it is suitable for handling high-phosphorus ores. The ores found in the Kerchensk area and the phosphoritic ores in the Kustanay area in Kazakhstan are treated by the Thomas process. Blowing with oxygen is said to have opened new possibilities for the converter process in the USSR. There are 26 Soviet references.

Edneral, F.P. Production of Electric Steel in the USSR 295
The author traces the development of electric steel production from the early twenties to the Sixth Five Year Plan. Production of steel is

Card 8/21

SOV/137-59-1-37

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 5 (USSR)

AUTHORS: Glinkov, M. A., Krivandin, V. A., Bugrova, B. A.

TITLE: Directed Flame Radiation With Uneven Temperature Distribution (Napravlennaya radiatsiya plameni pri neravnomernom raspredelenii temperatur)

PERIODICAL: Nauchn. dokl. vyssh. shkoly. Metallurgiya, 1958, Nr 1, pp 59-64

ABSTRACT: The investigation was carried out on a stand consisting of a shielded combustion chamber with three burners (of the concentric-tube type) forming three parallel, vertical flame jets set so close together that they may be considered as layers of a single flame sheet. The temperature of each layer of the flame was measured by a bare Pt - Pt/Rh thermocouple and the total radiation along the length of the flame was measured by a diaphragmed differential thermopile (Cu-constantan). City gas with a heat value of 3300 - 6600 kcal/m$^3$ was burned. Data are adduced on the effect of the distribution of temperatures, thermal load, excess-air coefficient, enrichment of air with $O_2$, and carburation with pulverized coal throughout the thickness of the flame on its radiation. Changes in the layer closest to

Card 1/2

SOV/137-59-...

Directed Flame Radiation With Uneven Temperature Distribution

the measuring device have a predominant effect on the radiation of the flame jet.

G. G.

Card 2/2

SOV/137-59-1-329

Translation from: Referativnyy zhurnal. Metallurgiya, 1959, Nr 1, p 41 (USSR)

AUTHORS: Glinkov, M. A., Kosterin, V. V.

TITLE: An Investigation of the Thermal Performance of a Recirculating Steel-smelting Furnace Designed by Prof. M. A. Glinkov Employing Ceramic Recuperators (Issledovaniye teplovoy raboty retsirkulyatsionnoy staleplavil'noy pechi sistemy prof. M. A. Glinkova s keramicheskimi rekuperatorami)

PERIODICAL: Izv. vyssh. uchebn. zavedeniy. Chernaya metallurgiya, 1958, Nr 1, pp 94-111

ABSTRACT: The 10-ton recirculating steel-smelting furnace (RSF) is equipped with two recuperators having a total area of 345 $m^2$. The furnace is fired with fuel oil, the degree of enrichment of air with $O_2$ being varied from 45 to 21% in the course of a heat. Compared with corresponding factors in open-hearth furnaces operated without $O_2$, the production efficiency of the RSF s is greater. The consumption of $O_2$ amounted at times to 270 kg/ton. An increase in the degree of oxidation of the slags constituted the major technological difficulty of the process; however, by means of appropriate selection of an

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SOV/137-59-1-329

An Investigation of the Thermal Performance of a Recirculating (cont.)

optimal oxygen-air ratio, this condition could be reduced to 14-18% ΣFe. The degree of oxidation of the metal was even lower in this process than in the case of standard open-hearth furnaces. A reduction in $O_2$ consumption is not justified economically since the cost of $O_2$ constitutes only a comparatively small fraction of the cost of a ton of steel. Owing to the insufficient length of the hearth, the advantages of two-sided heating of molten metal could not be fully evaluated, since the meeting of the flames in the center of the furnace produces a vigorous stream of gases resulting in the disintegration of the central portion of the crown of the furnace. The roof of the furnace could withstand a maximum of 175 smeltings. Because of the vigorous recirculation occurring within the hearth, the amount of smelting dust carried into the recuperators was considerably reduced (by 5-8 times), which greatly improved the operational performance of the latter.

M. M.

Card 2/2

AUTHORS: Glinkov, M. A., [illegible], N. A. SOV/163-58-2-22/46

TITLE: Measuring [illegible] in Short Channels by Means of Radioactive Indicators (Izmereniye skorosti potoka v [illegible] kanalakh s pomoshch'yu radioaktivnykh indikatorov)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 1958, Nr [illegible] (USSR)

ABSTRACT: A method for determining the mean flow rate in short channels by means of radioactive indicators was worked out. $Ag^{110}$ was used as $\gamma$-radioactive indicator and $Ag^{110}NO_3$ as water soluble compound. An equal distribution of the radioactive indicator introduced along the vertical direction of the channel was achieved, and the distribution of the flow of combustible products in the lower cross section of the channel was determined. The flow rate of the combustible products in the vertical direction of the channel amounts to [illegible],0 m/sec with a probable error of 8.[illegible] %. The method suggested makes possible the determination of the boundary of the flow in the vertical direction of the channel. There are [illegible] figures and [illegible] tables.

Card 1/2

[illegible]suring the Flow [illegible] in [illegible] 2'6
[illegible]tive Indicators

[illegible]: [illegible]oskovskiy institut [illegible]

[illegible]: Decem[illegible], [illegible]57

[illegible]

3-58-3-4/32

AUTHOR: Glinkov, M.A., Professor, Doctor of Technical Sciences

TITLE: New Progressive Features in Teaching General Scientific Subjects (Novoye, progressivnoye - v prepodavaniye obshchenauchnykh distsiplin) Must We Expand Only the General Scientific Cycle? (Nuzhno-li rasshiryat' tol'ko obshchenauchnyy tsikl?)

PERIODICAL: Vestnik Vysshey Shkoly, 1958, Nr 3, pp 21 - 24 (USSR)

ABSTRACT: The author disagrees with the following extreme view-points regarding higher school teaching methods: that special technological subjects should be reduced to a minimum while the general scientific and general engineering subjects should be increased; and that training in the student specialties should be increased. He explains how extremes can be reconciled and concludes that in order to improve teaching plans and programs there must be an increase in basic subjects and a transfer of the "theoretical fundamentals" (common to various specialties) from the special subject to the basic subject category. General scientific subjects should be increased only when badly needed, as in mathematics. The author admits that the better the students master formal mathematics, the easier they will comprehend engineering.

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S/55-3-4/32

New Progressive Features in Teaching General Scientific Subjects. Must We Expand Only the General Scientific Cycle?

However, if the basic subjects are not sufficiently developed the prevalence of general scientific subjects in the curriculum will not yield the desired results He emphasizes the importance of increasing the level of training in the theoretical fundamentals of technology. There is one Soviet reference.

ASSOCIATION: Moskovskiy institut stali imeni I.V. Stalina (Moscow Institute of Steel imeni I.V. Stalin)

AVAILABLE: Library of Congress

Card 2/2

AUTHORS: [illegible], [illegible], [illegible] SOV, [illegible]

TITLE: Calculation [illegible] the Exchange of the Heat Radiation of the Chambers of the Heating Shaft Employing Light Modelling [illegible]
([illegible])

PERIODICAL: [illegible] Metallurgiya, [illegible],
Nr [illegible] (USSR)

ABSTRACT: The light-modelling method is employed for the [illegible] of the heat radiation in industrial furnaces. A set of apparatus for light modelling was constructed. The zones of the exchange of heat radiations in the radiating system consist of [illegible] isothermal zones. The resulting current in zone [illegible] was determined. The angular coefficients $\varphi_{ik}$ on the [illegible] upper parts of the chambers were calculated by the following equation:

$$\varphi_{[illegible]a} = \frac{2F_{b}\varphi_{[illegible]a} + F_{c}\varphi_{ca} + 2F_{[illegible]}\varphi_{da}}{\Sigma F}$$

, the same way $\varphi_{[illegible]}$ can be used instead of $\varphi_{[illegible]}$. Examples for the calculation of the

Card 1/[illegible]

[illegible] the [illegible] of the Heat [illegible] in the [illegible]
[illegible] Heating Shaft Employing Light Modelling

[illegible] of the heat exchange in the heating shafts [illegible]. The [illegible] for calculating [illegible] [illegible] modelling were compared [illegible] according to the method suggested by [illegible]. The light-modelling method is [illegible] [illegible] and [illegible] the qualitative classification of the heat [illegible] [illegible] of different construction. There are 4 figures, [illegible], [illegible] of which are Soviet.

ASSOCIATION: [illegible] (Moscow Steel Institute)

SUBMITTED: [illegible]

Card [illegible]

GLINKOV, M.A., doktor tekhn.nauk, prof.; TYMCHAK, V.M., kand.tekhn.nauk

New design of recuperative soaking pits. Izv. vys. ucheb. zav.; chern. met. no.7:67-89 Jl '58. (MIRA 11:10)

(Furnaces, Heating)

GLINKOV, M.A., prof., doktor tekhn.nauk; PISKUNOV, A.A., inzh.

Modeling radiant heat exchanges in industrial furnaces by means of light. Izv.vys.ucheb.zav.; chern.met. no.11:65-76 '58.
(MIRA 12:1)

1. Moskovskiy institut stali. Rekomendovano kafedroy metallurgicheskikh pechey.
(Metallurgical furnaces) (Heat--Transmission)
(Engineering models)

GLINKOV, Mark Alekseyevich; SUSHKIN, I.N., red.; VAYNSHTEYN, Ye.B., tekhn.red.

[Principles of the general theory of the thermal operation of furnaces] Osnovy obshchei teorii teplovoi raboty pechei. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1959. 416 p. (MIRA 13:1)

(Thermodynamics) (Furnaces)

SOV/133-59-1-6/23

AUTHORS: ~~Glinkov, M.A.~~, Doctor of Technical Sciences and Demin, G.I., Candidate of Technical Sciences

TITLE: Recirculation-type Recuperative Steelmaking Furnace (Retsirkulyatsionnaya rekuperativnaya staleplavil'naya pech')

PERIODICAL: Stal', 1959, Nr 1, pp 24 - 31 (USSR)

ABSTRACT: The design and operation of a recirculation-type recuperative steelmaking furnace of 10 tons capacity is described. A recirculation furnace differs from an open-hearth furnace in that it operates with both burners simultaneously. Impact of two streams of gases in the centre of the furnace causes their intensive recirculation which sharply decreases the amount of dust in the waste gas. The design and dimensions of the furnace are shown in Figures 1, 2 and 3. In appearance the furnace is similar to an open-hearth furnace of the same capacity. Fuel oil is simultaneously supplied to both burners and the gaseous combustion products pass from the working volume through both parts along vertical flues into slag pockets and then to recuperators, waste gas flues and the chimney. Each recuperator was of 34.9 $m^3$ in volume and

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SOV/133-59-1-6/23

Recirculation-type Recuperative Steelmaking Furnace

240 $m^2$ in heating surface area. The stream of burning hot oil is used as an injector for air from the recuperator which decreases air losses. Proportioning of the supply of oil, oxygen and air is done separately for each flame. Recuperators are protected from overheating by an automatic supply of air to the overtube space in order to decrease the waste-gas temperature. Unfortunately, the recuperators were made of an insufficient volume (70% of the necessary) and their cleaning during operation was impossible due to insufficient cross-section of flues between recuperators and slag pockets. For a normal prolonged operation of recuperators only 1-2 rows of tubes from a high refractory material are necessary, the remaining tubes could be made from chamotte. Operation of the recuperator will be described in a separate paper. The durability of recuperator, first campaign - 1 480 heats, second 1 082. Air and recuperator's temperature are shown in Figure 4. Smelting of MSt3 killed steel in the furnace is described in some detail. Average technological indices of the heats are shown in the table; the dependence of the consumption of fuel and oxygen during charging and melting and of the duration of this period on the duration of

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charging is shown in Figure 5 and main characteristics of a heat in Figure 6. It is claimed that for the first time in steelmaking practice, the possibility of operation under industrial conditions of a recuperative furnace with ceramic recuperators capable of pre-heating air to 1 000 °C was demonstrated. The proving series of heats (68 heats) under conditions near to the normal operating conditions had the following mean operating indices (MSt.3 steel for a continuous casting machine): duration of one heat 2 hours 43 minutes, consumption of oil 178 kg/ton, consumption of oxygen 170 $m^3$/ton of liquid steel; the yield of liquid steel 91-93%. The furnace is suitable for the production of killed steel MSt.3 (for a continuous casting machine) in quality equal to that produced in a basic open-hearth furnace. As the velocity of decarburisation can be varied within a wide range (from 2.0 to 0.36% hr), the furnace is particularly suitable for smelting low-carbon and specially soft steels (the sum of admixtures $C + Mn + S + P < 0.075\%$). High productivity of the recirculation furnace led to a considerable economy in respect of the constant expenses and the cost of oxygen is more than covered by fuel economy. The overall cost of

SOV/133-59-1-6/23

Recirculation-type Recuperative Steelmaking Furnace

steel does not exceed that in the normal open-hearth furnaces. Under operating conditions of the experimental furnace it was difficult to establish the economic efficiency of recirculating recuperative furnaces. It would be advantageous to build a 50-100 ton furnace capable of operating with oil and a gas of a high calorific value. There are 6 figures, 1 table and 4 references, 1 of which is German and 3 Soviet.

ASSOCIATION: Moskovskiy institut stali (Moscow Institute of Steel)

Card 4/4

SOV [illegible]

18(3)

AUTHORS: Glinkov, M. A., Serokhvostov, A. L.

TITLE: A Model Investigation of the Processes of Settling and Carrying-out of Dust in Steel-melting Furnaces (Issledovaniye na stende protsessov osedaniya i vynosa pyli v staleplavil'nykh pechakh)

PERIODICAL: Nauchnyye doklady vysshey shkoly. Metallurgiya, 195[illegible], Nr 2, pp 84-89 (USSR)

ABSTRACT: The model of a steel-melting furnace was made of plexiglass on a scale of [illegible] : 15 (Fig 1). The air supply working as a model of the gas circulation could be blown in, as in the original, as a direct current with unilateral and double return flow. To imitate the coarse-grained dust, water was introduced into the tank of the model, and air was blown in by a series of tubes under the water surface. The drops carried away were collected in [illegible] measuring points (Fig 2) by means of rolls of filter paper. For the finer dust fraction the metal level of the tank was represented by a metal foil with 2[illegible] openings by which [illegible] [illegible] blown [illegible] cartridges and then was [illegible] in the [illegible] [illegible] settling under of powdered [illegible]. [illegible]

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[illegible]

A Model Investigation of the [illegible] of Settling and [illegible] of Dust in Steel-melting Furnaces

Different conditions of circulation. In [illegible] with [illegible] return flow, the [illegible] dust settling [illegible] flame. In the [illegible] the dust settles [illegible] in the [illegible] of the [illegible] walls. With the [illegible] return flow, the [illegible] of dust settling lies in the meeting point of the two flames. The settling of the coarse dust fraction [illegible] more irregularly than that of the fine dust. By reversing the flame, the dust settling does not change, but [illegible] regular. In case of [illegible] return flow, only fine dust is carried out of the furnace. The maximum dust [illegible] furnace is produced by direct blowing, the minimum in case of [illegible] return flow. There are [illegible] figures.

ASSOCIATION: [illegible]skovskiy institut stali ([illegible] Steel Institute)

SUBMITTED: [illegible]ly [illegible], 1958

Card 2/2

SOV/133-59-6-37/41

AUTHORS: Glinkov, M.A., Doctor of Technical Sciences and
Glinkov, G.M., Candidate of Technical Sciences

TITLE: Some Thermotechnical Problems of Large Capacity Open Hearth Furnaces (Nekotoryye voprosy teplotekhniki bol'shegruznykh martenovskikh pechey)

PERIODICAL: Stal', 1959, Nr 6, pp 568-572 (USSR)

ABSTRACT: Possibilities of increasing the productivity of open hearth furnaces per unit of their capacity is discussed. It is considered that the higher the furnace capacity, the higher the quality of the solid charge should be. This would permit retaining the level of irradiation factor on decreasing of the ratio of the surface area of the bath to the furnace capacity (S/T). The higher the furnace capacity the higher the quality of the liquid iron or semiproduct should be as an increase in the thickness of the slag layer unavoidably deteriorates conditions of heat transfer. Sufficiently advantageous heat exchange conditions inside the solid charge and liquid bath can be obtained on retaining S/T constant with increasing

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SOV/133-59-6-37/41

Some Thermotechnical Problems of Large Capacity Open Hearth Furnaces

furnace capacity. In order to obtain this a different type of steelmaking furnace is necessary - with a working space up to 10 - 12 m wide, hanging roof and two-sided charging (with a corresponding change in the distribution of equipment in the shop). The higher is the laying down property of the flame and its luminosity at the end of the smelting space the lower is non-uniformity in the heat exchange along the length of the furnace. Therefore on increasing the capacity of the furnaces, it is necessary to increase correspondingly the velocity of the fuel stream in order to obtain the required laying down capacity of the flame. In order to improve the flame luminosity at the end of the smelting space, it is necessary to use as a fuel or a carburising agent, heavy liquid fuels with a large ratio of C/H, on the decomposition of which complex hydrocarbon complexes are formed, securing stable luminosity of the flame.

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SOV/133-59-6-37/41

Some Thermotechnical Problems of Large Capacity Open Hearth Furnaces

A truly uniform heating of the baths of large furnaces can be obtained with a two-sided supply of fuel into the working space i.e. with simultaneous operation of two dog houses. On transferring an open hearth furnace on firing with oil or a cold gas of a high calorific value this problem can be solved easily by using three-channel dog houses (Fig 5). In each dog house either two side-channels or one central channel operates alternatively. The remaining three channels serve as waste gas flues to pass the waste gas to the regenerators - simultaneously through both dog houses. The movement of the gas in the working space will be mixed (counter-current and recirculation). As each dog house supplies through tuyeres the same amount of fuel, the heating conditions of both halves of the working space should be the same. All four regenerators are preheating air, the reversing system will be little changed. The separation of slag in slag pockets will be facilitated as due to the peculiar

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SOV/133-59-6-37/41

Some Thermotechnical Problems of Large Capacity Open Hearth Furnaces

feature of the gas movement in the working space the carry over of the slag decreases. There are 5 figures and 9 Soviet references.

Card 4/4

GLINKOV, M.A., prof., dokt.tekhn.nauk

Readers' response to A.D.Kliuchnikov's article "Method for a comparative evaluation of open-hearth furnace parts." Izv. vys.ucheb.zav.; chern.met. 2 no.8:179-181 Ag '59. (MIRA 13:4)

1. Moskovskiy institut stali.
(Open-hearth furnaces) (Kliuchnikov, A.D.)

PHASE I BOOK EXPLOITATION SOV/4732

Moscow. Institut stali

Proizvodstvo i obrabotka stali i splavov (Production and Treatment of Steel and Alloys) Moscow, Metallurgizdat, 1960. 462 p. (Series: Its: Sbornik, 39) 2,100 copies printed.

Ed.: Ye. A. Borko; Ed. of Publishing House: S. L. Zinger; Tech. Ed.: M. R. Kleynman; Editorial Council of the Institute: M. A. Glinkov, Professor, Doctor of Technical Sciences; R. N. Grigorash, Docent, Candidate of Technical Sciences; V. P. Yelyutin, Professor, Doctor of Technical Sciences; A. A. Zhukhovitskiy, Professor, Doctor of Chemical Sciences; I. N. Kidin, Professor, Doctor of Technical Sciences; B. G. Livshits, Professor, Doctor of Technical Sciences; A. P. Lyubimov, Professor, Doctor of Technical Sciences; I. M. Pavlov, Corresponding Member, Academy of Sciences USSR; and A. N. Pokhvisnev, Professor, Doctor of Technical Sciences.

PURPOSE: This book is intended for technical personnel in industry, scientific institutions and schools of higher education, dealing with open-hearth and electric-furnace steelmaking, metal rolling, physical metallurgy, metallography, and heat treatment. It may

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also be used by students specializing in these fields.

COVERAGE: The book contains results of theoretical and experimental investigations of metallurgical and heat-engineering processes in open-hearth and electric furnaces. Data are included on the following: desulfurizing of pig iron outside the blast furnace, interaction of oxides of the carbide-forming metals with solid carbon, the change of content of gases in the bath of the open-hearth furnace in various periods of melting, intensification of the electric melting of steel, etc. Other articles deal with the nonuniformity of deformation in rolling, the study of the continuous rolling process, the dependence of the friction-slippage coefficients in rolling on a number of factors, and other problems in the pressworking of metals. Articles on physical metallurgy and the theoretical principles and techniques of the heat treatment of steel are also included. No personalities are mentioned. References accompany most of the articles. There are 207 references, both Soviet and non-Soviet.

Card 2/10



Card 4/10

S/148/[illegible]/[illegible]/02/[illegible]/XX
A[illegible]/A[illegible]

AUTHORS: Glinkov, M. A.; Filimonov, Yu. P.; Kalvanchin, V. A.

TITLE: Thermal decomposition of gas containing methane in an oxidizing medium

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. [illegible] metallurgiya, no. 7, 1960, 193 - 197

TEXT: A luminous gas flame radiates more heat than a nonluminous one and its luminosity is determined by the presence of carbon-black particles. The thermal decomposition reaction of methane without air access has been studied (Ref. 1 F. Fischer, Brennst. Chemie, 1928, [illegible] 309; 1929, 10, 261. Ref. 2 and 3: see English-language publications), but in diffusion burning a high quantity of small volumes have a varying oxygen content, and two processes proceed at the same time - oxidation and thermal decomposition of methane. The laws of these processes have been studied at the Moscow Steel Institute. The test installation (Figure 1) consisted of heating zone (4) and cooling zone (7) for the gas-air mixture, an electrostatic precipitation vessel (8) and filters (9). The gas composition was: 92.6 % $CH_4$, 0.[illegible] % $C_nH_m$; 2.2 % $H_2$; [illegible].7 % [illegible]; [illegible] % $CO_2$; [illegible] % $O_2$

Card 1/

[illegible] (1) [illegible] the quantities of sooty carbon, the relative quantities of [illegible] the volume of [illegible] fractions. The temperatures in the reaction zone were 1,[illegible] 1,100; 1,200; 1,[illegible] and 1,400°C. At 1,000°C the gas in the reaction zone contained no oxygen, which proved that oxidation was over at 1,000°C. The CO content in the gas increased with the rise in temperature, and the $CO_2$ content dropped which is due to the $CO_2$ reduction reaction with CO formation and with continually increasing quantities of sooty carbon. More $CO_2$ and less CO formed when the air feed was increased. The reaction products in the precipitation vessel were a cloud varying in color from yellowish-white to black, and the precipitated flakes having a strong naphtaline smell were a mixture of soot and hydrocarbon compounds. Benzene, naphtalene, anthracene and other compounds were extracted with petroleum ether, and asphaltenes with benzene. Figure 3 presents the calculation results showing that the content of methane decreases with a rise in temperature, and the hydrogen content increases with an increase in air feed. [illegible] (1) sooty carbon forms in combined oxidation and thermal decomposition of methane due to thermal decomposition of nonoxidized part of methane, with the formation of com-

Card 2/5

plex hydrocarbon molecules as transient compounds. 2) No strong effect of oxidation on the composition of the forming products was stated. A reduction of $CO_2$ t CO on account of carbon forming during the decomposition was observed, but no effect of this process on the quantity of the forming products was revealed. 3) The dilution of gas with the formed oxidation products results in some shift of the methane decomposition reaction temperature into higher temperature ranges. There are 4 figures and 3 non-Soviet-bloc references; The references to English language publications read as follows: P. V. Wheelera, W. L. Wood, Fuel. 1928, 7, 535; 1930, 9, 567; K. Koboyaschi, K. Jamamoto, Journ. Chem. Ind. Japan, 1935, 38, 550; 1934, 37, 785.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: Nov. 30, 1959

S/148/60/000/009/025/025
A161/A030

AUTHORS: Glinkov, M. A., and Tsoy Yen Sir

TITLE: An experimental check of calculation methods for heating ingots in soaking pits

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 9, 1960, 191-198

TEXT: The various existing theoretical calculation methods for heating metal in soaking pits are based on different assumptions, and the calculation results are not always the same for the same cases. An experimental investigation has been carried out for a check. A scale model (1:15) of a soaking pit at the "Azovstal'" works was built with two top burners. Ingots were heated with thermocouples imitating the real heating process; the gas temperature was also measured with a sucking thermocouple ("otsasyvayushchaya termopara") in several spots in the work space and the mean temperature was calculated. In the ingots, the temperature was measured in the center of three portions with equal mass, and on the faces, and the mean was calculated. The obtained curves were compared with the curves obtained by

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An experimental check of calculation

S/148/60/000/009/025/025
A161/A030

calculation per the methods: Fur'ye-Greber, I.D. Semikin, G.P. Ivantsov; the method suggested by N.Yu. Tayts, D.V. Budrin, and V.N. Sokolov [Abstracter's note: Details of the listed calculation methods are not given]. The conclusions are the following: 1) The calculation method by Fur'ye-Greber based on the assumption of constant heat release and heat conduction coefficients gave a distorted picture; splitting of the heating process into intervals does not ensure sufficient accuracy. 2) The graphical method of G.P. Ivantsov, used with a high number of stages gives results more or less near the real. 3) Determination of total soaking time by D.V. Budrin's method is near the real. 4) The calculation method as suggested by V.N. Sokolov (Ref. 8: Raschety nagreva metalla (Metal Heating Calculations) Mashgiz, 1955) gives the best results, provided the temperature of the soaking pit changes little. This method is recommended for practical use. There are 4 figures and 8 Soviet-bloc references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: 12 April 1960

Card 2/2

GLINKOV, M.A., doktor tekhn.nauk; MEN'SHIKOV, R.I., kand.tekhn.nauk; KAGANOV, V.Yu., kand.tekhn.nauk; SOLOMENTSEV, S.L., inzh.

Automatic control of thermal and technological conditions in open-hearth furnace smelting. Biul. TSIICHM no.10:23-28 '60. (MIRA 15:4)

(Open-hearth furnaces) (Automatic control)

GLINKOV, M.A.; FILIMONOV, Yu.P.; KRIVANDIN, V.A.

Flame emanation during the heating of methane containing gas. Izv. vys. ucheb. zav.; chern. met. no. 11:149-155 '60. (MIRA 13:12)

1. Moskovskiy institut stali.
(Methane--Combustion)

S/148/60/000/012/015/020
A161/A133

AUTHOR: [illegible], M. A.

TITLE: The problem of the open-hearth furnace productivity indices (As a discussion)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 12, 1960, 135 - 138

TEXT: The old practice of rating the output of open hearth furnaces by the specific productivity (ton/$m^2$ per day) has become obsolete in view of the fact that in relatively small furnaces below 100-ton capacity the ratio tonnage/hearth area varied little, from 1.4 to 1.65, but in the modern 400 - 500-ton furnaces it reaches 5.0 - [illegible]. Besides this, the iron [illegible] is different at different plants and individual furnaces, and the specific productivity figures are lower for larger furnaces in view of the known fact that the heat exchange conditions are unfavorable. The author discusses several suggestions that have been made by other authors up to now, and refers in particular to the "ton/ton of charge per year" index suggested by D. A. Smolyarenko, N. I. Yefanov et al. (Ref. 1: Stal', 195[illegible], no. [illegible], 604 -

Card 1/[illegible]

S/133/60/000/012/011/020
A054/A029

The problem of the open-hearth furnace...

60?) which he considers more appropriate for the present state of open hearth production. In their investigations the authors utilized an analogous ratio (... of charge per hour) (... M. A. ..., ... Stal', 1959, ..., 568 - 572). The article includes a table illustrating the operation of eight furnaces at four Soviet plants - Magnitogorskiy metallurgicheskiy kombinat (MMK) (Magnitogorsk Metallurgical Combine); Kuznetskiy metallurgicheskiy kombinat (KMK) (Kuznetsk Metallurgical Combine); Nizhne-Tagil'skiy metallurgicheskiy kombinat (NTMK) (Nizhne-Tagil Metallurgical Combine); Alchevskiy metallurgicheskiy zavod (AMZ) Alchevsk Metallurgical Plant). The discussed suggestions include foreign practice (... in calendar time), and a system of "correction factors" taking into account the peculiarities of individual furnaces. The author is of the opinion that the taking into account of such coefficients would lead to abuse and complete confusion in rating the furnace productivity, but two of them he accepts as being of importance, viz. the oxygen effect and, in some cases, the metal grade being smelted. The author's conclusions: 1) Production in time unit per ton capacity is a more indicative value under modern conditions than production per square meter hearth area

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2) An index showing the heat work must be accepted, i.e. "kg/t-hr", or "ton/ton a day". 3) Comparison per calendar time is wrong for the heat work of a furnace since the shop conditions are not comparable. The conditions can be accounted for with the "extensivity factor". 4) The effect of the furnace heat work on the "extensivity factor" (the effect of the furnace life) exists, but it appears to be less marked than the effect of the maintenance organization and other factors that are in the down time, and may be disregarded. 5) Furnaces working with oxygen or [illegible] furnaces must be compared in separate groups. There is 1 table and 4 Soviet-bloc references.

ASSOCIATION: Moskovskiy institut stali (Moscow Steel Institute)

SUBMITTED: August 18, 1959

| Емкость печи, *т* | 200 | 200 | 250 | 250 | 400 | 400 | 400 | 500 |
|---|---|---|---|---|---|---|---|---|
| Завод и печь | ММК-А | КМК-Б | ММК-В | ММК-Г | КМК-Д | КМК-Е | НТМК-Ж | АМЗ-З |
| Площадь пода, $м^2$ | 65,7 | 71,4 | 73,8 | 73,8 | 75,4 | 71,4 | 81,4 | 96,7 |

GLINKOV, M.A., doktor tekhn.nauk

Thermotechnical problems in automatic control of furnaces. Mekh.i avtom.proizv. 14 no.5:15-18 My '60. (MIRA 14:2)
(Furnaces) (Automatic control)

AKSEL'RUD, L.G.; GLINKOV, M.A.; G...; LIFSHITS, A.Ye.; MALTSEV, ...

Prospects for improvements in ... of heating and heat-treating furnaces. Stal' 20 no.6:562-567 Je '60. (MIRA 14:2)
(Furnaces, Heating) (Furnaces, Heat-treating)

GLINKOV, M.A., doktor tekhn.nauk, prof.

Fifty years of existence of the Scientific Technological Society of Ferrous Metallurgy. Stal' 20 no.11:961-962 N '60.
(MIRA 13:10)

1. Chlen TSentral'nogo pravleniya nauchno-tekhnicheskogo obshchestva chernoy metallurgii.
(Iron—Metallurgy)

GLINKOV, M.A., prof., doktor tekhn.nauk, red.; KONDAKOW, V.V., prof., doktor tekhn.nauk, red.; KUDRIN, V.A., dotsent, kand.tekhn. nauk, red.; OYKS, G.N., prof., doktor tekhn.nauk, red.; YAVOYSKIY, V.I., prof., doktor tekhn.nauk, red.; BORKO, Ye.A., red.; GROMOV, N.D., red.izd-va; KARASEV, A.I., tekhn.red.

[New developments in the theory and practice of making open-hearth steel] Novoe v teorii i praktike proizvodstva martenovskoi stali. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1961. 439 p. (MIRA 14:4)

1. Moscow. Institut stali. 2. Moskovskiy institut stali (for Glinkov, Kudrin, Oyks, Yavoyskiy).
(Open-hearth process)

DIOMIDOVSKIY, Dmitriy Aleksandrovich, prof., doktor tekhn.nauk; GLINKOV, M.A., prof., doktor tekhn.nauk, retsenzent; MIKHAYLENKO, A.Ya., red.; ARKHANGEL'SKAYA, M.S., red.izd-va; DOBUZHINSKAYA, L.V., tekhn.red.

[Metallurgical furnaces in nonferrous metallurgy] Metallurgicheskie pechi tsvetnoi metallurgii. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1961. 728 p. (MIRA 14:6)

(Metallurgical furnaces)
(Nonferrous metals--Metallurgy)

S/137/61/000/011/011/123
A060/A101

AUTHOR: Glinkov, M.A.

TITLE: Thermotechnical problems in the automatic regulation of furnaces

PERIODICAL: Referativnyy zhurnal. Metallurgiya, no. 11, 1961, 14, abstract 11B84 (V sb. "Novoye v teorii i praktike proiz-va martenovsk. stali", Moscow, Metallurgizdat, 1961, 202-209, Discussion, 332-334)

TEXT: A distinctive peculiarity of furnaces is the interaction between the thermotechnical and the technological processes. An improvement in the automatic regulation of furnaces has a huge effect, since furnaces hold the first place in power consumption, and the coefficient of useful heat utilization in furnaces is comparatively low, being $\leq 0.25$ on the average. The main difficulty in making an improved system of automatic regulation of the thermal operation of the furnaces is the close interdependence of the thermotechnical and the technological processes. The course of the technological processes in heat-exchanger furnaces is related in a well-defined fashin with the dynamics of heat assimilation. The heat assimilation is the parameter which as-if connects the domain of technology with that of thermotechnics. A basic dynamic equation is derived for describing

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the thermal operation of a furnace: $Q_{TL}(\tau) = \frac{1}{\eta_{UT}(\tau)}[\Delta i(\tau) \cdot D(\tau) + Q^{M}_{esc}(\tau) - Q_{M}(\tau)]$ where $Q_{TL}$ is the thermal load of the fuel combustion, in kilocalories per hour; $\eta_{UT}$ is the coefficient of useful heat utilization of the furnace; D is the furnace productivity in kg/hr, $\Delta i$ is the function characterizing the technologically required heat expenditure for the material undergoing the heat-treatment, taking account of the thermal effect of any reactions in the material, in kilocalories/kg; $Q^{M}_{esc}(\tau)$ is the function characterizing the chemical and physical heat of the escape products from the combustion of gaseous products of the technological processes, in kilocalories per hour; $Q_{M}(\tau)$ is the function characterizing the behavior of the heat on account of the chemical and the physical heats of the gaseous products on the technological processes, in kilocalories/hour. Three principal methods of solving problems of the automatic regulation of the thermal operation of furnaces are considered: the analytic, the semi-empirical, and the empirical. It is noted that the design of systems for automatic regulation of furnaces is most often based upon the physical approach to the thermotechnical problems of regulation. It is proposed that special attention

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be paid to the elaboration of the analytic theory of the thermal operation of various furnaces as a basis for developing the scientific foundations of furnace regulation.

I. Polyak

[Abstracter's note: Complete translation]

Card 3/3

GLINKOV, M.A.; PORTNOV, A.A.

Flame testing of chambers with a vortex flow of gases and a water-cooled receiver in the center near the surface of the brickwork. Izv. vys.ucheb.zav.; chern.met. 4 no.5:184-188 '61. (MIRA 14:6)

1. Moskovskiy institut stali.
(Metallurgical furnaces--Testing)

GLINKOV, M.A.; STEPANOV, Ye.M.

Thermal ionization in flame and combustion intensification by the field of force. Izv.vys.ucheb.zav.; chern.met. 4 no.9:143-152 '61. (MIRA 14:10)

(Ionization) (Combustion)

GLIMOV, [illegible]; [illegible]

Effect of [illegible] on the aerodynamics and [illegible] [illegible] in [illegible] to [illegible]ting. Izv. vys. [illegible] zav.; chern. [illegible] (MIRA [illegible])

1. [illegible]kovski [illegible] li.
(Furnaces, [illegible]) (H[illegible]t--Transmission)

GLINKOV, M.A.; REKHTMAN, A. Ya.

Effect of aerodynamics on dust deposition in slag basins and vertical flues. Izv.vys.ucheb. zav.; chern. met. no.3:161-171 '61. (MIRA 14:3)

1. Moskovskiy institut stali.
(Metallurgical furnaces—Aerodynamics)

S/148/61/000/003/014/015
A161/A133

AUTHORS: Glinkov, M. A., For[illegible], A. A.

TITLE: The gas mechanics in sectional furnaces for rapid steel heating

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Chernaya metallurgiya, no. 3, 1961, 172 - 183

TEXT: A detailed description is presented of tests with rapid-heating cyclone type sectional furnaces and those with burners directing hot gas directly on the face of square billets. The flow was studied in furnace models with the aid of water and dye, and with air. Various chamber diameters and different outlet duct dimensions were tested; the test billets were of round and square shape. The article includes diagrams showing the flow speed measured in different spots of the chambers and calculations. The [illegible] a schematic view of the flow in a chamber with burners [illegible] of billet faces. Conclusions: The cyclone motion ensures a [illegible] ignition and intense burning of gas-air mixture, and the [illegible] to the lining [illegible] a high tempera- ture in the lining and high heat in the chamber space, which in combination re- sults in an intense heat transfer [illegible] surface. [illegible]

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S/148/[illegible]

The gas [illegible] heating [illegible] steel. A[illegible]/A[illegible]

non-uniform heating in square [illegible] chambers with large diameter, may be reduced to a minimum by [illegible] a larger diameter of the outlet [illegible], which lowers the flow speed at the billet [illegible] the zone of laminar flow. It is not possible to obtain a completely uniform heating of square billets over the entire surface in a cyclone furnace, for the heat transfer from the faces into the center of billet by heat conductivity is faster than that from the ribs. The highest heat supply to surface in the [illegible] heat transfer from surface to the billet body is achieved when the gas jets are directed to the center of the billet faces, and this arrangement produces more even heating over the entire surface. In cyclone chambers of small diameter the laminar zone at the billet is absent, the gas speed at the billet surface is higher, and the heat transfer by [illegible] more intense. The most advantageous chamber type is of small diameter and with partition walls. There are 6 figures and 4 Soviet-bloc references.

ASSOCIATION: Moskovskiy [illegible] stali (Moscow Steel Institute)

SUBMITTED: June 21 [illegible]

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30582
S/148/61/000/009/011/012
E111/E135

11.7200

AUTHORS: Glinkov, M.A., and Stepanov, Ye.M.

TITLE: Thermal ionization in a flame and intensification of combustion by applying an electric field

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Chernaya metallurgiya, no.9, 1961 143-152.

TEXT: Stable combustion, with branching of chains, begins after the production of a definite concentration of free radicals and ionized particles. The initial energy impulse (whose magnitude depends on the energy barrier of the fuel molecules) leads to ionization and free-radical formation and the branching-chain combustion reaction. In the present work the authors report and discuss their experiments on combustion from the preionization aspect. The main part of the experiments was on premixed air/gas mixtures with an excess-air coefficient of unity, [Abstractor's note: I think this means with the stoichiometric proportion of air for complete combustion.] with gas flows of 0.24, 0.52 and 0.72 nm3/hour and a burner bore of 15 mm. At all the gas flows the ratio of visible-flame length to length of inner

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E111/E135

Thermal ionization in a flame ...

cone was equal to 2.2. To prevent detachment of the flame a little gas was added through an annular gap near the burner mouth. The ionization characteristics were measured every 10 mm along the flame, at 5-6 radial points at each level. Measurements were also made when the gas/air mixture had not been pre-mixed additional investigation then being made of the effect of preheating of the gas (to 200, 400, 600 and 750 °C) on ionization and temperature in the flame. Ionization was found by measuring flame conductivity using two 2-mm diameter diametrically opposed stainless-steel probes insulated in quartz tubes. The amplified current was measured with a micro-ammeter the ionic concentration was not calculated. Temperature was measured with a platinum platinum-rhodium thermocouple. The ionization maxima were found to be close to the temperature maxima. From the observed changes of ionization and temperature up the flame it is concluded that in the initial part of the flame rapid ionization is produced due to rapid temperature rise here there are considerably more ionized than reacting molecules. After reaching a maximum, ionization falls rapidly, while temperature continues to rise until heat

X

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... flame ...

... to the surroundings leads to a slow fall. In this region ... consumed only for maintaining temperature; the ... limited by the arrival of fresh fuel molecules. ... temperature ... ionization plots show hysteresis loops whose areas represent the amount of heat released in the combustion of a given quantity of fuel ions. Since the calorific value of the gas ... constant, the ratio of gas flows shows the relative ... in heat evolution at different flows: the ratios agree ... with the ratio of the corresponding hysteresis-loop ... Without pre-mixing but with preheating the ionization maximum ... gradually with fuel flow V according to

$$i_{max} = ... V$$

... is the initial ionization of molecules, depending on ... temperature or other form of ionizing energy, and also on ... depends on the fuel (0.31 and 0.58 for the fuel used ... preheats of under and over 700 °C, respectively). Combustion can be intensified by moving the ionization maximum towards the root of the flame by applying any form of energy at the root. This was observed in experiments in which the heating rates of

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metal [illegible] with the same heating area were determined at [illegible] the flame with and without the application of an [illegible] [Abstracter's note: no information on the [illegible] the field [illegible] its application is given]. Although [illegible] flame is affected by the field, the effect is not [illegible] temperature is not uniform. The effect of the field [illegible] with increasing fuel flow. Heat transfer from the flame [illegible] was also increased (by a maximum of [illegible] rate of a lean bath was increased 20-25% by [illegible] gas flow in this experiment was [illegible] is not to be regarded as an [illegible] as a means of concentrating the [illegible] the fuel [illegible]

[illegible]

ASSOCIATION: [illegible] (Moscow Steel Institute)

SUBMITTED: [illegible]

GLINKOV, M.A., doktor tekhn.nauk, prof.; DEMIN, G.I., kand.tekhn.nauk, dotsent

Operation of recirculating-type recuperative steel smelting furnaces. (MIRA 14:4)
Stal' 21 no. 4:317-318 Ap '61.

1. Moskovskiy institut stali.
(Smelting furnaces)

GLINKOV, M.A., doktor tekhn.nauk,prof.; GLINKOV, G.M., kand.tekhn.nauk

Response to A. D. Kliuchnikov's remarks. Stal' 21 no.6:566 Je '61. (MIRA 14:5)

(Open-hearth furnaces—Design and construction)

GLINKOV, M.A.; GLINKOV, G.M.

Role of heat generation in open-hearth furnace baths.
Stal' 21 no.8:751-753 Ag '61. (MIRA 14:9)
(Open-hearth furnaces)

GLINKOV, M.A.; REKHTMAN, A.Ya.; NEVEDOMSKAYA, I.N.

Gas flow and pressure distribution in multichamber holding furnaces. Stal' 22 no.1:82-86 Ja '62. (MIRA [illegible])

1. Moskovskiy institut stali.

(Furnaces, Heating)

S/194/62/000/006/071/232
D295/D308

AUTHORS: Glinkov, M.A., Men'shikov, R.I., Kaganov, V.Yu., and Solomentsev, S.L.

TITLE: Development of a complex automatic system for controlling the thermal and technological operating conditions of fusion in open-hearth furnaces using computer equipment

PERIODICAL: Referativnyy zhurnal. Avtomatika i radioelektronika, no. 6, 1962, abstract 6-2-200 u (V sb. Primeneniye vychisl. tekhn. dlya avtomatiz. proiz-va, M., Mashgiz, 1961, 225-257)

TEXT: Work carried out at the Department of Metal Furnaces of the Moskovskiy institut stali (Moscow Steel Institute) in 1957-58 has shown the possibility of designing a closed-loop controller of the thermal operating conditions of an open-hearth furnace, where technological and organization factors are taken into account. The block diagram of a computer-type automatic control system has been developed in which the controlled parameter is the heat absorbed by

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the bath. In practice the heat absorbed by the bath is determined
by the computer from the behavior of fusion by proceeding from the
difference between the heat input (the combustion of carbon being
allowed for) and the quantity of heat carried away by the products
of combustion and expended for thermal losses. In the program unit
heat absorption is assigned according to the behavior of each pe-
riod of fusion. The set value of heat absorption for a given in-
stant of fusion is worked out by the program unit according to the
quantity of heat that must be transmitted to the bath up to the end
of the period, according to loading schedule, carbon-combustion rate
and other factors. The difference between the actual and the set
value of heat absorption determines the heat load assigned to the
regulator. The regulating system is of the closed-loop type with
respect to the basic parameter-heat absorption. The rate of libera-
tion of carbon oxides from the bath, the volume of the combustion
products and the in-flow and out-flow of air from the working space
are determined according to the consumption of fuel, air consump-
tion, total composition of the combustion products and by the re-
sult of measurement of their quantity in the general flue. Data
obtained in the computer unit on heat absorption and carbon combus-
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[illegible]/62/000/[illegible] A/071/[illegible]
Development of a complex automatic ... [illegible]

tion, can be used for controlling flame reversing and for regulating the pressure in the working space. Since several quantities depending on the process conditions are introduced in the computer unit, intermediate and final calculations are checked periodically in the circuit by means of spot measurements of the corresponding parameters. The computing formulae required a large number of measurements some of which are difficult to carry out under conditions of open-hearth furnace production. Therefore a simplified procedure was developed in 1958-59 for determining the heat absorbed by the bath and the rate of combustion of carbon. 6 figures. [Abstracter's note: Complete translation.]

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GLINKOV, Mark Alekseyevich; VAGIN, A.A., red. izd-va; SUSHKIN, I.N., red. izd-va; MIKHAYLOVA, V.V., tekhn. red.

[Principles of the general theory of furnaces]Osnovy obshchei teorii pechei. Izd.2., ispr. i dop. Moskva, Metallurgizdat, 1962. 575 p. (MIRA 15:9)
(Metallurgical furnaces—Design and construction)

GLINKOV, M.A.; PROSYANOV, Yu.F.

Effect of the properties of liquid fuel on the luminosity of open-hearth furnace flames. Izv. vys. ucheb. zav.; chern. met. 5 no.5:170-180 '62. (MIRA 15:6)

1. Moskovskiy institut stali i Izhorskiy zavod.
(Liquid fuels)
(Open-hearth furnaces—Combustion)

GLINKOV, M.A.; SEROKHVOSTOV, A.L.

Mechanics of gases in the hearth of a uniflow and recirculating type steel smelting furnace. Izv. vys. ucheb. zav.; chern. met. 5 no.7:188-195 '62. (MIRA 15:8)

1. Moskovskiy institut stali i splavov.
(Smelting furnaces) (Gas flow)

GLINKOV, M.A.; D'YACHKOV, B.G.

Connection between ionization and heat emission during the burning by torch of methane-bearing gas. Izv.vys.ucheb.zav.; chern.met. 5 no.11:181-187 '62. (MIRA 15:12)

1. Moskovskiy institut stali i splavov.
(Gas torches) (Ionization of gases)

GLINKOV, M.A., prof., doktor tekhn.nauk; PROSYANOV, Yu.F., inzh.

Effect of liquid fuel properties and the design of atomizers on heat processes in open-hearth furnaces. Stal' 22 no.7:653-658 Jl '62. (MIRA 15:7)

1. Moskovskiy institut stali i Izhorskiy zavod.
(Open-hearth furnaces--Design and construction)

GLINKOV, M.A., prof., doktor tekhn.nauk; MITKALINNYY, V.I., dotsent, kand. tekhn.nauk; KHE YU-TSZIN' [Ho Yu-chin]

Characteristics of aerodynamics in 600 and 900-ton open-hearth furnaces with single-channel ports. Stal' 22 no.11:1051-1055 N '62. (MIRA 15:11)

1. Moskovskiy institut stali.
(Open-hearth furnaces—Aerodynamics)

BUDRIN, Dmitriy Vasil'yevich; GLINKOV, Mark Alekseyevich, prof., doktor tekhn. nauk; KUZ'MIN, Mikhail Aleksandrovich; PLOTNIKOV, Liveriy Alekseyevich; SEMIKIN, Iosif Danilovich; TROYB, Samuil Grigor'yevich; SAL'NIKOV, A.P., red.izd-va; ISLENT'YEVA, P.G., tekhn. red.

[Metallurgical furnaces] Metallurgicheskie pechi. [By] D.V. Budrin i dr. Moskva, Metallurgizdat. Pt.1. [Fuel, refractories, principles of heat engineering processes] Toplivo, ogneupory, osnovy pechnoi teplotekhniki. 1963. 436 p. (MIRA 16:10)
(Metallurgical furnaces)

GLINKOV, M.A.; D'YACHKOV, B.G.

Comparison of certain burner arrangements by their ionizing characteristics. Izv.vys.ucheb.zav.; chern.met. 6 no.1:179-184 '63. (MIRA 16:2)

1. Moskovskiy institut stali splavov.
(Gas burners) (Ionization of gases)

GLINKOV, M.A.; SEROKHOVOSTOV, A.L.

Mixing of flows in blast furance hearths with uniflow and recirculation. Izv. vys. ucheb. zav.; chern. met. 6 no.3: 203-208 '63. (MIRA 16:5)

1. Moskovskiy institut stali i splavov.
(Blast furances—Combustion) (Gas flow)

GLINKOV, M.A.

Results of the inter-university conference on methods of calculating metallurgical furnace efficiency. Izv. vys. ucheb. zav.; chern. met. 6 no.5:185-187 '63. (MIRA 16:7)

1. Moskovskiy institut stali i splavov.
(Metallurgical furnaces) (Heat--Transmission)

GLINKOV, M.A.

Ways of developing methods of calculating furnace efficiency. Izv. vys. ucheb. zav.; chern. met. 6 no.9:189-193 '63. (MIRA 16:11)

1. Moskovskiy institut stali i splavov.

GLINKOV, M.A.; STUL'PIN, Ye.A.

Heat generation in steel [illegible] hearth furnaces. Izv. vys. ucheb. [illegible] 223-229 '63. (MIRA 17:3)

1. Moskovskiy institut [illegible].

GLINKOV, M.A., prof., doktor tekhn.nauk

Interuniversity conference on methods of calculating the efficiency of metallurgical furnaces. Stal' 23 no.3:286-287 Mr '63.
(MIRA 16:5)

1. Moskovskiy institut stali i splavov.
(Metallurgical furnaces)

[illegible]LIGNYY,V[illegible]; [illegible]UKHIN, [illegible];
[illegible]CHENKO, [illegible];
GLINKOV, [illegible]

[Metallurgical furnaces; an atlas] Metallurgicheskie pechi; atlas. Izd.[illegible], perer. [illegible], Metallurgiia, [illegible] 519 p.
[illegible] for the atlas [illegible]
"Metallurgicheskie pechi." [illegible]

GLINKOV, M.A.; KAGANOV, V.Yu.; BLINOV, O.M.

Obtaining information necessary for the optimum control of thermal conditions in furnaces. Izv. vys. ucheb. zav.; chern. met. 7 no.1:162-165 '64. (MIRA 17:2)

1. Moskovskiy institut stali i splavov.

GLINKOV, M.A.; STUL'PIN, Ye.A.

Oxidizing properties of 500-ton open-hearth furnaces during the smelting period. Izv. vys. ucheb. zav.; chern. met. 7 no.1:174-177 '64. (MIRA 17:2)

1. Moskovskiy institut stali i splavov.

GLINKOV, M.[illegible], [illegible]
V.I., inzh.; [illegible]
G.[illegible], inzh.

[illegible]